Acta Biologica Szeged. 26 (1—4), pp. 161—164 (1980)

COMPLEX ECOLOGICAL INVESTIGATIONS IN A SANDY SOIL GRASSLAND: AIMS AND GENERAL METHODOLOGY

L. MÓCZÁR, L. GALLÉ, GY. GYŐRFFY and
ERZSÉBET HORNUNG (Mrs)

Department of Zoology, Attila József University, Szeged

(Received October 24, 1979)

Abstract

The Department of Zoology of the Attila József University has been carrying out, since 1976 a complex ecological investigation into the sandy soil grassland in the Bugac area of the Kiskunság National Park. In addition to the structural and functional study of the natural grass, the researches also include problems of the perturbation of the ecosystem (grazing, insecticides, fertilizing, water concentration) and of succession.

After a preliminary orientation survey in 1975, members of the terrestrial ecological working group of the Department of Zoology of the Attila József University began in 1976 a complex ecological investigation into a sandy soil grassland in the Kiskunság National Park. For the research work, a two-hectare non-pastured grassland was marked out of a sandy soil of several thousand hectares in the Bugac area of the National Park.

The area is divided into two terrains: the deep errwind-furrows formed by the wind and the tops of sand-hills forming a higher terrain. In the wind-furrows, the effect of environment is more humid, in the soil the ratio of the desiltable fraction is higher. The soil of sand-hills is drier and — in respect of its structural composition — is of drift-blown sand type. The vegetation — with the exception of a few spots — is a closed sandy soil grassland. The plant cover on the highest parts of the sand-hills is *Festucetum vaginatae*, more below, in very small spots is *Astragalo-Festucetum rupicolae (=sulcatae)*, but the most part of the higher terrain is covered with *Potentillo-Festucetum pseudovinae danubiale*. In the wind-furrows, the most important assotiation is *Molinio-Salicetum rosmarinifoliae*, here and there with the fragments of *Schoenetum nigricantis*. In the graze part of the grassland, *Potentillo-Festucetum pseudovinae danubiale* is dominant.

The complex investigation into the nature-close grassland-ecosystem mean both thematical and methodological complexities. In this sense our aim is to explore the most important structural characteristics and key-processes of the grassland ecosystem. The main programme of the structural investigations is to study the single elements (phytocoenosis, zoocoenosis, physical conditions) of the ecosystem, including the qualitative-quantitative conditions. When planning the functional investigations we were led by two points of view: to know the energy-flow of the system and to investigate into the regulation mechanisms of the popula-

tions that are of key-importance in respect to the single energy levels, as well as to the ecosystem.

Apart from the above mentioned basic research activity, our work included some practical points of view as well. In this respect, the following themes were contemplated:

1) the effect of grazing on the structural and functional peculiarities of the system;

2) the effect of intensive fertilization;

3) the effect of insecticides;

4) the effect of increasing the water-supply. The latter is justified by the fact that water deficiency is the pessimal ecological factor in the whole area. By terminating this, some changes may be induced in the system. The speed and direction of these changes is not only perturbed but will probably give important information on the stability of the starting system as well. From theoretical point of view, too, we expect some remarkable results from studying the succession, to be carried out on a grassland which will artificially be forced into a pioneer ecological phase.

Our aims have some nature conservation aspects as well: as this area is part of the National Park, these investigations may also give some instruction as to which effects the system can undergo without changing the most important characteristics of the system and what kinds of intervention are necessary for preserving similar grasslands in a natural or almost natural state.

The high number of partial tasks connected with realizing the set aims are coordinated by four members of the ecological working group but they cannot manage this work entirely. Therefore, four amateur research workers, students of the Department of Botany of the Attila József University, are involved into this work, as well. The research work is carried out by 16 persons who spent in the years 1976—1979, so far, about 380 field days in the area. The mass of material and facts collected for elaboration is very large, for instance, the insect material is until now more than 100.000 specimens.

In accordance with our aims summarized above, we started the elaboration of the following subjects:

1) Study from among the exigences the microclimate and soil structure (Department of Botany, Attila József University; GALLÉ, GYŐRFFY);

2) Measurement of the phytomass, and its annual changes has been carried out since 1977 and the phytocoenological survey of the area began, as well (Department of Botany, GYŐRFFY, GALLÉ, KOVÁCS);

3) The qualitative-quantitative exposure of the basic fauna (MÓCZÁR, GALLÉ, GYŐRFFY);

4) From among the phytophagous populations, the ecological analysis of the Cicadinea, Orthoptera, Heteroptera and Lepidoptera groups. In the first two groups, according to energetic points of view, as well (GYŐRFFY);

5) From among the carnivores, the regulative factors and role of Formicoidea populations, as well as the structural analysis of the Araneidea and Lacertilia groups (GALLÉ);

6) The density relations and energetic role of the decomposing Isopoda and Diplopoda populations were exposed, the investigation into the Oribatei and Collembola groups is carried out at present (HORNUNG);

7) From among "sustinent" groups which are important for preserving the vegetation, the study of Apoidea has been carried out according to structural points of view (TANÁCS);

8) From 1977, the effect of grazing and fertilizing has been investigated at a phytoecological level. Our zooecological investigations have included, since 1978, the grazed areas, as well. In 1979, we began to study the effect of insecticides and in 1980, we begin the effect of fertilization and water concentration on animal communities (GYŐRFFY, GALLÉ, Department of Botany);

9) From among the regulating mechanisms of the natural system, the study of the subsystems: plant — phytophaga (Orthoptera, Cicadinea); phytophaga — Carnivora (Cicadinea, Diptera — Formicoidea, Araneidea) and Carvinora — Carnivora (Araneidea — Formicoidea) has been carried out (GALLÉ, GYŐRFFY).

From the investigations until now, three theses (FERÓ, 1977; FARKAS, 1978; KISS, 1979), one university doctoral thesis (HORNUNG, 1979) and one thesis for the candidature of the Hungarian Academy of Sciences (GALLÉ, 1979) were made. In the papers, dealing with the details of the subject, and to be published in the future, the designation "ecosystem of a sandy soil grassland" takes place.

In order to make the research work still more complex, we wish to extend our investigations into the (at present non-studied) following subjects, as well: chemistry of the soil, biochemical cycles, cryptogamous plants, microdecomposing organisms, a more detailed investigation into Diptera, Coleoptera, Hymenoptera, Aphidinea and Physopoda groups. In addition to these, we expect some results from the comparison with similar material of alkali areas (MÓCZÁR and BÍRÓ 1980).

The Kiskunság National Park Directory has been very helpful in our investigations, apart from placing the area at our disposal. Since 1978, our work has been carried out in the framework of a research agreement, with the pecuniary assistance of the Hungarian Academy of Sciences. We wish to express our gratitude to both organs.

References

FARKAS, L. (1978): Araneae vizsgálatok gyep-ökoszisztémában (Araneae investigations in a grassland ecosystem). — Manuscript, 1—32.

FERÓ, M. (1977): Oribatei vizsgálatok gyepökoszisztémában (Oribatei investigations in a grassland ecosystem). — Manuscript, 1—40.

GALLÉ, L. Jr. (1979): Formicoidea populációk denzitása és produktivitása gyep-cönózisokban (Density and productivity of Formicoidea populations in grassland coenoses). — Manuscript, 1—125.

GALLÉ, L. Jr. (1980): Dispersion of high density ant populations in sandy soil grasslands. — Acta Biol. Szeged. *26*, 129—135.

GYŐRFFY, GY. (1980): Auchenorrhyncha of the upper level of a sandy soil grassland: Data on quantitative relations, bionomics, and ecological valency. — Acta Biol. Szeged. *26*, 137—142.

HORNUNG, H. E. (1980): Data on the oxygen consumption of Isopoda and Diplopoda species. — Acta Biol. Szeged (in print). - - : Investigations into the productivity of some macro-decomposer Arthropod species. — Acta Biol. Szeged (in print).

KISS, G. (1979): Orthoptera vizsgálatok a Kiskunsági Nemzeti Parkban, psammophil gyep-ökoszisztémában (Orthoptera investigations in the Kiskunság National Park, in a psammophilous grassland ecosystem). — Manuscript: 1—35.

MÓCZÁR, L., BÍRÓ, A. (1980): On the insect fauna of the alkali flat at Kiskundorozsma. — Acta Biol. Szeged. *26*, 147—159.

Address of the authors:
Prof. Dr. L. MÓCZÁR
Dr. L. GALLÉ
Dr. GY. GYŐRFFY
Dr. ERZSÉBET HORNUNG (Mrs.)
Department of Zoology, A. J. University, H-6701 Szeged,
P. O. Box 428. Hungary